

CPC**COOPERATIVE PATENT CLASSIFICATION****G21C**

NUCLEAR REACTORS (analogue computers therefor [G06G 7/54](#); fusion reactors, hybrid fission-fusion reactors [G21B](#); nuclear explosives [G21J](#))

WARNING

The following IPC groups are not used in the CPC scheme:

- [G21C 1/01](#) covered by all other groups of [G21C](#)
- [G21C 19/33](#) covered by all other subgroups of [G21C 19/34](#)

G21C 1/00**Reactors**

- G21C 1/02 . Fast fission reactors, i.e. reactors not using a moderator; { Metal cooled reactors; Fast breeders}
- G21C 1/022 .. {Characterised by the concept and properties of the core}
- G21C 1/024 ... {where the core is divided in zones with fuel and zones with breeding material}
- G21C 1/026 ... { Reactors not needing refueling, i.e. reactors of the type breed-and-burn, e.g. travelling or deflagration wave reactors or seed-blanket reactors}
- G21C 1/028 .. {cooled by a pressurised coolant (cooling arrangements [G21C 15/00](#))}
- G21C 1/03 .. cooled by a coolant not essentially pressurised, e.g. pool-type reactors
- G21C 1/04 . Thermal reactors; { Epithermal reactors}
- G21C 1/06 .. Heterogeneous reactors, i.e. in which fuel and moderator are separated
- G21C 1/07 ... Pebble-bed reactors; Reactors with granular fuel
- G21C 1/08 ... moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor ([G21C 1/22](#) takes precedence)
- G21C 1/082 {Reactors where the coolant is overheated}
- G21C 1/084 {Boiling water reactors}
- G21C 1/086 {Pressurised water reactors}
- G21C 1/09 Pressure regulating arrangements, i.e. pressurisers
- G21C 1/10 moderator and coolant being different or separated
- G21C 1/12 moderator being solid, e.g. Magnox reactor {gas-graphite reactor}
- G21C 1/14 ... moderator being substantially not pressurised, e.g. swimming-pool reactor ([G21C 1/22](#) takes precedence)
- G21C 1/16 moderator and coolant being different or separated, e.g. sodium-graphite reactor {sodium-heavy water reactor, organic coolant-heavy water reactor}
- G21C 1/18 coolant being pressurised
- G21C 1/20 moderator being liquid, e.g. pressure-tube reactor {also the construction of the pressure-tubes}
- G21C 1/22 ... using liquid or gaseous fuel
- G21C 1/24 .. Homogeneous reactors, i.e. in which the fuel and moderator present an effectively homogeneous medium to the neutrons

- G21C 1/26 . . . Single-region reactors
- G21C 1/28 . . . Two-region reactors

- G21C 1/30 . Subcritical reactors; { Experimental reactors with exception of swimming-pool reactors or zero-energy reactors}
- G21C 1/303 . . {Experimental and irradiation arrangements inside the reactor (irradiation loops [G21C 1/306](#); material testing by neutrons [G01N 23/005](#))}
- G21C 1/306 . . {Irradiation loops}

- G21C 1/32 . Integral reactors, i.e. reactors wherein parts functionally associated with the reactor but not essential to the reaction, e.g. heat exchangers, are disposed inside the enclosure with the core ([G21C 1/02](#) to [G21C 1/30](#) take precedence)
- G21C 1/322 . . { wherein the heat exchanger is disposed above the core}
- G21C 1/324 . . { wherein the heat exchanger is disposed beneath the core}
- G21C 1/326 . . { wherein the heat exchanger is disposed next to or beside the core}
- G21C 1/328 . . { wherein the prime mover is also disposed in the vessel}

- G21C 3/00** **Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements**

- G21C 3/02 . Fuel elements {(manufacture thereof [G21C 21/02](#))}
- G21C 3/04 . . . Constructional details
- G21C 3/041 . . . {Means for removal of gases from fuel elements}
- G21C 3/042 . . . {Fuel elements comprising casings with a mass of granular fuel with coolant passages through them}
- G21C 3/044 . . . {Fuel elements with porous or capillary structure}
- G21C 3/06 . . . Casings; Jackets
- G21C 3/07 characterised by their material, e.g. alloys
- G21C 3/08 provided with external means to promote heat-transfer, e.g. fins, baffles
- G21C 3/10 End closures; {Means for tight mounting therefor}
- G21C 3/105 {Flattened end-closures}
- G21C 3/12 Means forming part of the element for locating it within the reactor core {means not forming part of the element [G21C 5/06](#)}
- G21C 3/14 Means forming part of the element for inserting it into, or removing it from, the core; Means for coupling adjacent elements, {e.g. to form a stringer}
- G21C 3/16 . . . Details of the construction within the casing
- G21C 3/17 Means for storage or immobilisation of gases in fuel elements
- G21C 3/18 Internal spacers or other non-active material within the casing, e.g. compensating for expansion of fuel rods or for compensating excess reactivity ([interlayers G21C 3/20](#))
- G21C 3/20 with coating on fuel or on inside of casing; with non-active interlayer between casing and active material {with multiple casings or multiple active layers}
- G21C 3/22 . . with fissile or breeder material in contact with coolant
- G21C 3/24 . . with fissile or breeder material in fluid form within a non-active casing
- G21C 3/26 . . with fissile or breeder material in powder form within a non-active casing
- G21C 3/28 . . with fissile or breeder material in solid form within a non-active casing

- G21C 3/30 . Assemblies of a number of fuel elements in the form of a rigid unit
- G21C 3/32 .. Bundles of parallel pin-, rod-, or tube-shaped fuel elements
- G21C 3/3206 ... {Means associated with the fuel bundle for filtering the coolant, e.g. nozzles, grids}
- G21C 3/3213 ... {Means for the storage or removal of fission gases (means for the storage of fission gases in the elements [G21C 3/16](#); means for the removal of fission gases from elements [G21C 3/04](#))}
- G21C 3/322 ... Means to influence the coolant flow through or around the bundles
- G21C 3/324 ... Coats or envelopes for the bundles
- G21C 3/3245 {made of moderator material}
- G21C 3/326 ... comprising fuel elements of different composition; comprising, in addition to the fuel elements, other pin-, rod-, or tube-shaped elements, e.g. control rods, grid support rods, fertile rods, poison rods or dummy rods
- G21C 3/328 Relative disposition of the elements in the bundle lattice
- G21C 3/33 ... Supporting or hanging of elements in the bundle ([spacer grids G21C 3/34](#)); Means forming part of the bundle for inserting it into, or removing it from, the core; Means for coupling adjacent bundles
- G21C 3/3305 { Lower nozzle}
- G21C 3/331 { Comprising hold-down means, e.g. springs}
- G21C 3/3315 { Upper nozzle}
- G21C 3/332 Supports for spacer grids
- G21C 3/334 ... Assembling { , maintenance or repair of} the bundles {(assembling, maintenance or repair of other reactor components [G21C 19/207](#))}
- G21C 3/335 ... Exchanging elements in irradiated bundles
- G21C 3/336 ... Spacer elements for fuel rods in the bundle ([spacer grids G21C 3/34](#))
- G21C 3/338 Helicoidal spacer elements
- G21C 3/34 ... Spacer grids
- G21C 3/3408 {Compact spacer grids, e.g. made of a plate or a blade}
- G21C 3/3416 {Spacer grids formed by metallic wires, e.g. springs}
- G21C 3/3424 {Fabrication of spacer grids}
- G21C 3/344 formed of assembled tubular elements
- G21C 3/348 formed of assembled non-intersecting strips
- G21C 3/352 formed of assembled intersecting strips
- G21C 3/356 being provided with fuel element supporting members
- G21C 3/3563 {Supporting members formed only by deformations in the strips}
- G21C 3/3566 {Supporting members formed only of elements fixed on the strips}
- G21C 3/36 .. Assemblies of plate-shaped fuel elements or coaxial tubes
- G21C 3/38 . Fuel units consisting of a single fuel element in a supporting sleeve {or in another supporting element}
- G21C 3/40 . Structural combination of fuel element with thermoelectric element for direct production of electric energy from fission heat (for temperature measurement [G21C 17/10](#)){ or with another arrangement for direct production of electric energy, e.g. a thermionic device (combination with thermoelements for temperature measurements [G21C 17/102](#))}

- G21C 3/42 . Selection of substances for use as reactor fuel
 - G21C 3/44 .. Fluid or fluent reactor fuel
 - G21C 3/46 ... Aqueous compositions
 - G21C 3/48 True or colloidal solutions of the active constituent
 - G21C 3/50 Suspensions of the active constituent; Slurries
 - G21C 3/52 ... Liquid metal compositions
 - G21C 3/54 ... Fused salt, oxide or hydroxide compositions
 - G21C 3/56 ... Gaseous compositions; Suspensions in a gaseous carrier
 - G21C 3/58 .. Solid reactor fuel {Pellets made of fissile material}
 - G21C 3/60 ... Metallic fuel; Intermetallic dispersions
 - G21C 3/62 ... Ceramic fuel
 - G21C 3/623 {Oxide fuels}
 - G21C 3/626 {Coated fuel particles}
 - G21C 3/64 Ceramic dispersion fuel, e.g. cermet
- G21C 5/00 Moderator or core structure; Selection of materials for use as moderator**
- G21C 5/02 . Details
 - G21C 5/04 .. Spatial arrangements allowing for Wigner growth
 - G21C 5/06 .. Means for locating or supporting fuel elements {(means forming part of the element [G21C 3/12](#))}
 - G21C 5/08 .. Means for preventing undesired asymmetric expansion of the complete structure; {Stretching devices, pins}
 - G21C 5/10 .. Means for supporting the complete structure {(arrangements for supporting vessels and core-structures [G21C 13/024](#))}
 - G21C 5/12 . characterised by composition, e.g. the moderator containing additional substances which ensure improved heat resistance of the moderator {(purification of fluid moderators during the operation of the reactor [G21C 19/30](#))}
 - G21C 5/123 .. {Moderators made of organic materials}
 - G21C 5/126 .. {Carbonic moderators (carbon and graphite in general [C01B 31/00](#); refractory carbon-bulbs [C04B 35/00](#); carbon electrodes [C25B](#))}
 - G21C 5/14 . characterised by shape
 - G21C 5/16 .. Shape of its constituent parts
 - G21C 5/18 . characterised by the provision of more than one active zone
 - G21C 5/20 .. wherein one zone contains fissile material and another zone contains breeder material
 - G21C 5/22 .. wherein one zone is a superheating zone
- G21C 7/00 Control of nuclear reaction**
- G21C 7/005 . {Flux flattening}

- G21C 7/02 . by using self-regulating properties of reactor materials, {e.g. Doppler effect}{arrangements that involve temperature stability [G21C 7/32](#)}
- G21C 7/04 .. of burnable poisons ([burnable poisons in fuel rods G21C 3/326](#))
- G21C 7/06 . by application of neutron-absorbing material, i.e. material with absorption cross-section very much in excess of reflection cross-section
- G21C 7/08 .. by displacement of solid control elements, e.g. control rods
- G21C 7/10 ... Construction of control elements
- G21C 7/103 Control assemblies containing one or more absorbants as well as other elements, e.g. fuel or moderator elements
- G21C 7/107 Control elements adapted for pebble-bed reactors
- G21C 7/11 Deformable control elements, e.g. flexible, telescopic, articulated
- G21C 7/113 Control elements made of flat elements; Control elements having cruciform cross-section
- G21C 7/117 Clusters of control rods; Spider construction
- G21C 7/12 ... Means for moving control elements to desired position ([dropping rods in an emergency G21C 9/02](#))
- G21C 7/14 Mechanical drive arrangements
- G21C 7/16 Hydraulic or pneumatic drive
- G21C 7/18 ... Means for obtaining differential movement of control elements
- G21C 7/20 ... Disposition of shock-absorbing devices ([shock-absorbers in general F16F](#)){Braking arrangements}
- G21C 7/22 .. by displacement of a fluid or fluent neutron-absorbing material, {e.g. by adding neutron-absorbing material to the coolant}
- G21C 7/24 .. Selection of substances for use as neutron-absorbing material
- G21C 7/26 . by displacement of the moderator or parts thereof {by changing the moderator concentration}
- G21C 7/27 .. Spectral shift control
- G21C 7/28 . by displacement of the reflector or parts thereof
- G21C 7/30 . by displacement of the reactor fuel or fuel elements
- G21C 7/32 . by varying flow of coolant through the core {by adjusting the coolant or moderator temperature}
- G21C 7/34 . by utilisation of a primary neutron source
- G21C 7/36 . Control circuits
- G21C 9/00** **Emergency protection arrangements structurally associated with the reactor** {e.g. safety valves provided with pressure equalisation devices}{[emergency cooling arrangements G21C 15/18](#)}
- G21C 9/001 . {against explosions e.g. blast shields}
- G21C 9/002 . {against Na- or Ka- reactions}

- G21C 9/004 . Pressure suppression
- G21C 9/008 .. by rupture-discs or -diaphragms
- G21C 9/012 .. by thermal accumulation or by steam condensation, e.g. ice condensers

- G21C 9/016 . Core catchers

- G21C 9/02 . Means for effecting very rapid reduction of the reactivity factor under fault conditions, e.g. reactor fuse; {Control elements having arrangements activated in an emergency}{control elements per se [G21C 7/00](#)}
- G21C 9/022 .. {Reactor fuses}
- G21C 9/024 .. {Rupture diaphragms}
- G21C 9/027 .. by fast movement of a solid, e.g. pebbles
- G21C 9/033 .. by an absorbent fluid

- G21C 9/04 . Means for suppressing fires {Earthquake protection}
- G21C 9/06 .. Means for preventing accumulation of explosives gases, e.g. recombiners

G21C 11/00 **Shielding structurally associated with the reactor**

- G21C 11/02 . Biological shielding (in general [G21F](#)){Neutron or gamma shielding}
- G21C 11/022 .. {inside the reactor vessel}
- G21C 11/024 ... {structurally combined with the casing}
- G21C 11/026 .. {in apertures or channels through a wall}
- G21C 11/028 .. {characterised by the form or by the material}
- G21C 11/04 .. on waterborne craft

- G21C 11/06 . Reflecting shields, i.e. for minimising loss of neutrons

- G21C 11/08 . Thermal shields; Thermal linings, i.e. for dissipating heat from gamma radiation which would otherwise heat an outer biological shield {Thermal insulation}
- G21C 11/081 .. {consisting of a non-metallic layer of insulating material}
- G21C 11/083 .. {consisting of one or more metallic layers}
- G21C 11/085 ... {consisting exclusively of several metallic layers}
- G21C 11/086 .. {consisting of a combination of non-metallic and metallic layers, e.g. metal-sand-metal-concrete}
- G21C 11/088 .. {consisting of a stagnant or a circulating fluid}

G21C 13/00 **Pressure vessels; Containment vessels; Containment in general (for chemical or physical processes [B01J 3/00](#); pressure vessels in general [F16J 12/00](#))**

- G21C 13/02 . Details
- G21C 13/022 .. {Ventilating arrangements}
- G21C 13/024 .. Supporting constructions for pressure vessels or containment vessels
- G21C 13/028 .. Seals, e.g. for pressure vessels or containment vessels
- G21C 13/0285 ... {for container apertures}

- G21C 13/032 . . Joints between tubes and vessel walls, e.g. taking into account thermal stresses
- G21C 13/036 . . . the tube passing through the vessel wall, i.e. continuing on both sides of the wall
- G21C 13/04 . . Arrangements for expansion and contraction
- G21C 13/06 . . Sealing-plugs (for pressure vessels in general [F16J 13/00](#))
- G21C 13/067 . . . for tubes, e.g. standpipes; Locking devices for plugs
- G21C 13/0675 {Seals for the plugs}
- G21C 13/073 . . . Closures for reactor-vessels, e.g. rotatable
- G21C 13/0735 {Seals for closures or for rotatable closures}

- G21C 13/08 . Vessels characterised by the material; Selection of materials for pressure vessels
- G21C 13/087 . . Metallic vessels
- G21C 13/0875 . . . {Tube-type vessels, e.g. for not essentially pressurised coolants}
- G21C 13/093 . . Concrete vessels
- G21C 13/0933 . . . {made of prestressed concrete}
- G21C 13/0936 {Particulars concerning prestressing devices and cables}

- G21C 13/10 . Means for preventing contamination in the event of leakage, {e.g. double wall}

- G21C 15/00** **Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants**

- G21C 15/02 . Arrangements or disposition of passages in which heat is transferred to the coolant; {Coolant flow control devices ([G21C 19/04](#) takes precedence; coolant flow control through fuel assemblies, e.g. flow restrictors [G21C 3/322](#))}
- G21C 15/04 . . from fissile or breeder material {([G21C 3/32](#) takes precedence)}
- G21C 15/06 . . . in fuel elements
- G21C 15/08 . . from moderating material
- G21C 15/10 . . from reflector or thermal shield
- G21C 15/12 . . from pressure vessel; from containment vessel
- G21C 15/14 . . from headers; from joints in ducts

- G21C 15/16 . comprising means for separating liquid and steam (separating in general [B01D](#); steam traps [F16D](#))

- G21C 15/18 . Emergency cooling arrangements; Removing shut-down heat
- G21C 15/182 . . {comprising powered means, e.g. pumps}

- G21C 15/20 . Partitions or thermal insulation between fuel channel and moderator

- G21C 15/22 . Structural association of coolant tubes with headers (joints of tubes in general [F16L](#))

- G21C 15/24 . Promoting flow of the coolant (electrodynamic pumps [H02K 44/02](#))
- G21C 15/243 . . for liquids
- G21C 15/247 . . . for liquid metals
- G21C 15/25 . . . using jet pumps

- G21C 15/253 . . . for gases, e.g. blowers
- G21C 15/257 . . . using heat-pipes [{\(in general F28D, F28F\)}](#)
- G21C 15/26 . . . by convection, e.g. using chimneys, using divergent channels

- G21C 15/28 . . . Selection of specific coolants [\(if serving as the moderator G21C 5/12; compositions per se C09K 5/00; {organic coolants G21C 5/123}\)](#); [{Additions to the reactor coolants, e.g. against moderator corrosion \(purification and regeneration of the reactor coolants G21C 19/30\)}](#)

- G21C 17/00** **Monitoring; Testing** [\(measuring in general G01\); { Maintaining}](#)

- G21C 17/001 . . . [{Mechanical simulators \(electrical or magnetic simulators G06G 7/54\)}](#)
- G21C 17/002 . . . [{Detection of leaks \(by testing the coolant or the moderator G21C 17/04\)}](#)

- G21C 17/003 . . . Remote inspection of vessels, e.g. pressure vessels
- G21C 17/007 . . . Inspection of the outer surfaces of vessels
- G21C 17/01 . . . Inspection of the inner surfaces of vessels
- G21C 17/013 . . . Inspection vehicles

- G21C 17/017 . . . Inspection or maintenance of pipe-lines or tubes in nuclear installations

- G21C 17/02 . . . Devices or arrangements for monitoring coolant or moderator
- G21C 17/021 . . . [{Solid moderators testing, e.g. graphite}](#)
- G21C 17/022 . . . for monitoring liquid coolants or moderators
- G21C 17/0225 [{ Chemical surface treatment, e.g. corrosion \(corrosion prevention in presence of water from scale removal or by modification of the properties of the liquid C02F 5/00; inhibiting corrosion by adding corrosion inhibitors C23F 11/00\)}](#)
- G21C 17/025 for monitoring liquid metal coolants [{\(molten metal sampling in general G01N 1/125\)}](#)
- G21C 17/0255 [{Liquid metal leaks detection \(detecting leaks in pipe-line systems in general F17D 5/00\)}](#)

- G21C 17/028 . . . for monitoring gaseous coolants
- G21C 17/032 . . . Reactor-coolant flow measuring or monitoring [{\(measuring volume or mass flow in general G01F\)}](#)
- G21C 17/035 . . . Moderator- or coolant-level detecting devices [{\(indicating or measuring liquid level in general G01F 23/00\)}](#)

- G21C 17/038 . . . Boiling detection in moderator or coolant
- G21C 17/04 . . . Detecting burst slugs
- G21C 17/041 [{characterised by systems for checking the coolant channels, e.g. matrix systems}](#)
- G21C 17/042 [{Devices for selective sampling, e.g. valves, shutters, rotatable selector valves}](#)
- G21C 17/044 [{Detectors and metering devices for the detection of fission products}](#)
- G21C 17/045 [{Precipitation chambers}](#)
- G21C 17/047 [{Detection and metering circuits}](#)
- G21C 17/048 [{characterised by a special construction of fuel elements, e.g. by a confined "tracer"}](#)

- G21C 17/06 . Devices or arrangements for monitoring or testing fuel or fuel elements outside the reactor core, e.g. for burn-up, for contamination ([G21C 17/08](#), [G21C 17/10](#) take precedence; detecting leaking fuel elements during reactor operation [G21C 17/04](#))
- G21C 17/063 .. {Burn-up control ([G21C 17/066](#) takes precedence)}
- G21C 17/066 .. {Control of spherical elements}
- G21C 17/07 .. Leak testing

- G21C 17/08 . Structural combination of reactor core or moderator structure with viewing means, e.g. with television camera, periscope, window

- G21C 17/10 . Structural combination of fuel element, control rod, reactor core, or moderator structure with sensitive instruments, e.g. for measuring radioactivity, strain
- G21C 17/102 .. {the sensitive element being part of a fuel element or a fuel assembly (structural combination with a thermoelectric element for direct production of electrical energy [G21C 3/40](#))}
- G21C 17/104 .. Measuring reactivity
- G21C 17/108 .. Measuring reactor flux
- G21C 17/112 .. Measuring temperature
- G21C 17/116 .. Passages or insulators, e.g. for electric cables
- G21C 17/12 .. Sensitive element forming part of control element

- G21C 17/14 . Period meters

- G21C 19/00** **Arrangements for treating, for handling, or for facilitating the handling of, fuel or other materials which are used within the reactor, e.g. within its pressure vessel**

- G21C 19/02 . Details of handling arrangements
- G21C 19/04 .. Means for controlling flow of coolant over objects being handled; Means for controlling flow of coolant through channel being serviced, {e.g. for preventing "blow-out"}
- G21C 19/06 .. Magazines for holding fuel elements or control elements
- G21C 19/065 ... {Rotatable magazines}
- G21C 19/07 ... Storage racks; Storage pools
- G21C 19/08 .. Means for heating fuel elements before introduction into the core; Means for heating or cooling fuel elements after removal from the core
- G21C 19/10 .. Lifting devices or pulling devices adapted for co-operation with fuel elements or with control elements ([manipulators B25J](#))
- G21C 19/105 ... with grasping or spreading coupling elements
- G21C 19/11 ... with revolving coupling elements, e.g. socket coupling
- G21C 19/115 ... with latching devices and ball couplings
- G21C 19/12 .. Arrangements for exerting direct hydraulic or pneumatic force on fuel element or on control element

- G21C 19/14 . characterised by their adaptation for use with horizontal channels in the reactor core

- G21C 19/16 . Articulated or telescopic chutes or tubes for connection to channels in the reactor core

- G21C 19/18 . Apparatus for bringing fuel elements to the reactor charge area, e.g. from a storage place
- G21C 19/19 . Reactor parts specifically adapted to facilitate handling, e.g. to facilitate charging or discharging of fuel elements
- G21C 19/20 . Arrangements for introducing objects into the pressure vessel; Arrangements for handling objects within the pressure vessel; Arrangements for removing objects from the pressure vessel
- G21C 19/202 .. {Arrangements for handling ball-form, i.e. pebble fuel}
- G21C 19/205 .. {Interchanging of fuel elements in the core, i.e. fuel shuffling}
- G21C 19/207 .. {Assembling, maintenance or repair of reactor components ([G21C 3/334](#) takes precedence)}
- G21C 19/22 .. Arrangements for obtaining access to the interior of a pressure vessel whilst the reactor is operating
- G21C 19/24 ... by using an auxiliary vessel which is temporarily sealed to the pressure vessel
- G21C 19/26 . Arrangements for removing jammed or damaged fuel elements or control elements; Arrangements for moving broken parts thereof
- G21C 19/28 . Arrangements for introducing fluent material into the reactor core; Arrangements for removing fluent material from the reactor core ([pumping coolant G21D](#))
- G21C 19/30 .. with continuous purification of circulating fluent material, e.g. by extraction of fission products {deterioration or corrosion products, impurities, e.g. by cold traps (purification of circulating fluid fuels [G21C 19/50](#); separation in general [B01D](#))}
- G21C 19/303 ... specially adapted for gases ([decontamination of gases G21F 9/02](#))
- G21C 19/307 ... specially adapted for liquids ([decontamination of liquids G21F 9/04](#))
- G21C 19/31 for molten metals
- G21C 19/313 using cold traps
- G21C 19/317 ... Recombination devices for radiolytic dissociation products
- G21C 19/32 . Apparatus for removing radioactive objects or materials from the reactor discharge area, e.g. to a storage place; Apparatus for handling radioactive objects or materials within a storage place or removing them therefrom ([disposal of waste material G21F 9/00](#))
- G21C 19/34 . Apparatus or processes for dismantling nuclear fuel, e.g. before reprocessing; {Apparatus or processes for dismantling strings of spent fuel elements}([shielded cells G21F 7/00](#))
- G21C 19/36 .. Mechanical means only
- G21C 19/365 ... Removing cannings or casings from fuel
- G21C 19/37 by separating into pieces both the canning or the casing and the fuel element, e.g. by cutting or shearing
- G21C 19/375 ... Compacting devices, e.g. for fuel assemblies
- G21C 19/38 .. Chemical means only
- G21C 19/40 . Arrangements for preventing occurrence of critical conditions, e.g. during storage
- G21C 19/42 . Reprocessing of irradiated fuel

- G21C 19/44 . . . of irradiated solid fuel
- G21C 19/46 Aqueous processes, {e.g. by using organic extraction means, including the regeneration of these means}
- G21C 19/48 Non-aqueous processes
- G21C 19/50 . . . of irradiated fluid fuel, {e.g. regeneration of fuels while the reactor is in operation}

G21C 21/00 **Apparatus or processes specially adapted to the manufacture of reactors or parts thereof (in general section B, e.g. B23)**

- G21C 21/02 . . . Manufacture of fuel elements or breeder elements contained in non-active casings
- G21C 21/04 by vibrational compaction or tamping {of fuel in the jacket}
- G21C 21/06 by {rotatable} swaging {of the jacket around the fuel}
- G21C 21/08 by a slip-fit cladding process {by crimping the jacket around the fuel}
- G21C 21/10 by extrusion, drawing, or stretching {by rolling, e.g. "picture frame" technique}
- G21C 21/12 by hydrostatic or thermo-pneumatic canning {in general by pressing without lengthening, e.g. explosive coating}
- G21C 21/14 by plating {the fuel} in a fluid
- G21C 21/16 by casting or dipping techniques
- G21C 21/18 Manufacture of control elements covered by group [G21C 7/00](#)

G21C 23/00 **Adaptations of reactors to facilitate experimentation or irradiation**

G21C 2001/00 **Reactors**

- G21C 2001/04 . . . Thermal reactors; { Epithermal reactors}
- G21C 2001/06 Heterogeneous reactors, i.e. in which fuel and moderator are separated
- G21C 2001/08 moderator being highly pressurised, e.g. boiling water reactor, integral super-heat reactor, pressurised water reactor ([G21C 1/22 takes precedence](#))
- G21C 2001/088 Inherently safe boiling water reactors

G21C 2003/00 **Reactor fuel elements and their assemblies; Selection of substances for use as reactor fuel elements**

- G21C 2003/02 . . . Fuel elements {(manufacture thereof [G21C 21/02](#))}
- G21C 2003/04 Constructional details
- G21C 2003/045 Pellets
- G21C 2003/047 Pellet-clad interaction
- G21C 2003/048 Shape of pellets
- G21C 2003/30 . . . Assemblies of a number of fuel elements in the form of a rigid unit
- G21C 2003/32 Bundles of parallel pin-, rod-, or tube-shaped fuel elements
- G21C 2003/322 Means to influence the coolant flow through or around the bundles

- G21C 2003/3225 by waterrods
- G21C 2003/326 . . . comprising fuel elements of different composition; comprising, in addition to the fuel elements, other pin-, rod-, or tube-shaped elements, e.g. control rods, grid support rods, fertile rods, poison rods or dummy rods
- G21C 2003/3262 Enrichment distribution in zones
- G21C 2003/3265 Radial distribution
- G21C 2003/3267 Axial distribution
- G21C 2003/34 . . . Spacer grids
- G21C 2003/3432 Grids designed to influence the coolant, i.e. coolant mixing function

- G21C 2013/00 **Pressure vessels; Containment vessels; Containment in general** (for chemical or physical processes [B01J 3/00](#); pressure vessels in general [F16J 12/00](#))**

- G21C 2013/02 . Details
- G21C 2013/06 . . Sealing-plugs (for pressure vessels in general [F16J 13/00](#))
- G21C 2013/063 . . . Seals for closures or for rotatable closures

- G21C 2015/00 **Cooling arrangements within the pressure vessel containing the core; Selection of specific coolants****

- G21C 2015/18 . Emergency cooling arrangements; Removing shut-down heat
- G21C 2015/182 . . {comprising powered means, e.g. pumps}
- G21C 2015/185 . . . using energy stored in reactor system
- G21C 2015/187 . . . using energy from the electric grid